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AUTHOR	Hamilton, James L.; Budoff, Milton
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ABSTRACT

The study investigated the feasibility of M. Budoff and M. Friedman's (1964) learning potential paradigm as an assessment approach with 40 moderately and severely mentally retarded persons (aged 12 to 22 years). Ss were tested three times: initially, after one week, and after one month with a match-to-sample block design test. Twenty of the Ss were randomly assigned to a 30-minute training session which occurred on the day prior to the first retest. Pretrained scores were positively correlated with IQ. Improvement following training was not related to IQ, but was significantly related to two validity measures. Results suggested that assessment of learning potential by means of a learning task rather than IQ is more appropriate for retarded persons. (Author/DB)

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James L. Hamilton and Milton Budoff

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Research Institute For Educational Problems
12 Maple Avenue Cambridge, Massachusetts

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Abstract

This study investigated the feasibility of Budoff and Friedman's (1964) learning potential paradigm as an assessment approach with moderately and severely mentally retarded persons. Forty Ss were tested three times: initially, after one week, and after one month with a match-to-sample block design test. Twenty of these Ss were randomly assigned to a 30-minute training session which occurred on the day prior to the first retest. Pretrained scores were positively correlated with IQ (PPVT). Improvement following training was not related to IQ, but was significantly related to two validity measures. Implications of these findings are discussed.

LEARNING POTENTIAL

AMONG THE MODERATELY AND SEVERELY MENTALLY RETARDED[1]

James L. Hamilton and Milton Budoff

Research Institute for Educational Problems

Past research on assessing the abilities of moderately and severely retarded persons reveals varying degrees of dissatisfaction with conventional tests, such as the Stanford-Binet or Peabody Picture Vocabulary Test (PPVT), when used as the sole predictors of learning ability. The usefulness of standard tests has been questioned for several reasons: (a) the response requirements of many assessments penalize the moderately and severely retarded, a population replete with multiple handicapping conditions (O'Connor, Justice, & Payne, 1970); (b) the single administration format of standard tests untenably assumes that the person's initial responses are reliable (Barrett, 1965; Zeaman & House, 1963) and that the person has a normal experiential background from which he has spontaneously learned (Clarke & Clarke, 1967); and (c) data from conventional tests are frequently inadequate as predictors of learning ability (Gardner, 1945; Talkington, 1967).

These shortcomings suggest the need for new assessment formats which could be used to indicate the ability of moderately and severely retarded persons to learn and profit from instructional experiences. Because of the high incidence of speech and language problems among these persons, the assessment should be nonverbal and couched in a supportive, non-penalizing context to maximize the person's efforts.

Numerous investigators (Luria, 1961; Penrose, 1934; Tobias, 1960; Vygotsky, 1934) have suggested the incorporation of instruction within an assessment procedure so that the person's familiarity with the task can be assured. With the exception of Schucman's (1960) study, however, the use of a training-within-testing model has been largely neglected with the moderately and severely retarded.

This study explored the applicability of the learning potential model advanced by Budoff and Friedman (1964) to the moderately and severely mentally retarded. This assessment paradigm consists of pre- and posttesting with an intervening session of task-relevant instruction on similar but non-test items. Budoff (1967) describes three types of response to the modified Kohs Block Design task among IQ-defined borderline and mildly retarded students: those who demonstrate a substantial increment as a function of the coaching experience (gainers), those who do not (nongainers), and those who score high on the pretest (high scorers). With this population, the learning potential assessment has been shown to be highly useful for predicting performance in a variety of ability and motivational domains (Budoff, 1967, 1973; Budoff, Meskin, & Harrison, 1971).

In this first study of applying the learning potential assessment model to moderately and severely retarded persons it was hypothesized that (a) trained samples of moderately and severely retarded students will profit from instruction on a nonverbal reasoning task; (b) among the trained samples, learning ability can be predicted from posttraining learning potential scores; (c) conventional IQ data will correlate

highly with pretraining scores but relate minimally to improvement following training.

Method

Subjects

The sample consisted of 40 institutionalized mentally retarded persons who ranged in chronological age (CA) from 12 to 22 years and in PPVT IQ from less than 10 to 51. The visual and motor skills of each S were determined by a screening test (to be described later) to be sufficient to allow at least a minimal level of performance on the tasks in the study. Twenty pairs of Ss were approximately matched on pretraining scores on the learning potential task. One member of each pair was randomly assigned to the trained condition; his control was not trained. Two levels of IQ were investigated: a low IQ group, ranging in IQ from less than 10 to 31 and a high IQ group ranging in IQ from 32 to 51. Within the low IQ group, the trained and control groups had a mean PPVT IQ of 16.3 (±7.8) and 14.0 (±3.3) and a mean CA of 194.1 (±28.4) and 192.3 (±29.6) months, respectively. The high IQ trained and control groups had a mean PPVT IQ of 40.6 (±6.1) and 42.4 (±6.1) and a mean CA of 174.1 (±28.0) and 205.3 (±23.7) months, respectively. All Ss were enrolled in an institutional school program at the time of the study. Length of institutionalization ranged from one to 20 years.

Learning Potential Test Measure

The task consisted of a modification of the Kohs Block Designs used by Budoff and Friedman (1964). Items were developed which constituted a logical

downward extension of the Kohs designs so that moderately and severely mentally retarded students could successfully complete the easiest items. This Extended Kohs test was composed of 13 difficulty levels with three test items at each level. The test can be characterized as a match-to-sample task with block design pictures serving as the sample, and concrete objects (one-inch blocks) available for construction of the match. Test problems ranged from simple color discriminations to complex four block pattern constructions. The easiest items required simple color discrimination and color matching, e.g., to align horizontally two different one-color blocks, a red and a white block. The more complex patterns, such as a red "V" on a white background, required S to manipulate four half-color blocks. Similar problems appear in the Kohs series and the Wechsler subtests.

Learning Potential Demonstration-Training Items

Thirteen demonstration-training items were developed to correspond to each difficulty level on the test. These items were used in the three testing sessions and the training session. During testing, these items were used by E to demonstrate equivalent design constructions at particular difficulty levels. During the training session, the same items were used to teach S strategies for solving problems at a given difficulty level. Each S was trained on four of these non-test items: the training item which corresponded to the highest level of difficulty S successfully completed during pretraining, followed by the training items which corresponded to the next three difficulty levels.

Procedure

The screening test involved having each S demonstrate correct matching of single blocks to one-color pictures of blocks. After the

screening session, the Extended Kohs Test was administered individually three times. The experimental variable of coaching was introduced six days following the first test administration at which time S received an individual training session lasting no more than 30 minutes. On the following day, both the trained and control Ss were retested with the Extended Kohs Test. After approximately one month, trained and control Ss were retested with the Extended Kohs Test to determine the continuing effects of the coaching experience. During each testing session, E constructed a demonstration item prior to each problem level. After viewing this demonstration, S was required to construct two of the three test items correctly from the designs to achieve credit at that problem level. Testing was discontinued when S missed three difficulty levels in succession.

The training procedure consisted of several steps: (a) assisting S initially in his construction of the design, (b) calling attention to the separateness of the blocks making up the design, (c) requiring S to actively point, block by block, to his constructed design and the corresponding blocks on the design card, and (d) repeating the process so that S could practice and become familiar with the materials. For the two-color block designs, E emphasized the building of a "stripe" or a "point" by encouraging S to attend to their colors and their directions, e.g., a red point, pointing down.

As a test of the second hypothesis, a modified version of the Knox Cube Test (Arthur, 1947) was administered to the trained Ss approximately one week after the delayed Extended Kohs posttest. The Knox is a

nonverbal visual memory test which requires S to reproduce visually presented tapping sequences. Specifically, the test involves E demonstrating a pencil-tapping sequence on four stationary wooden blocks, e.g., positions one, four, and three, followed by S attempting to remember and tap the same blocks in the same order. The test was modified slightly by adding six items to the scale: four one-sequence taps to determine whether S had the idea of the task and two two-sequence items to extend the lower end of the scale.

In addition, a questionnaire was administered to each trained S's classroom teacher who was requested to rate each S as "gainer" or "nongainer" on the basis of his experiences with S in a teaching situation. Each teacher was asked to make that judgment on the basis of his experience in teaching the student a performance skill as opposed to a verbal skill (for a more detailed description of the method, see Hamilton, 1972).

Results

The number of levels correct on each administration of the Extended Kohs Test was used as the dependent measure in a three-way repeated measures analysis of variance: IQ (two levels) X Training Group (trained-nontrained) X Testing (three administrations). In this analysis, the Testing factor was partitioned into two single degree of freedom contrasts: pretrained versus posttrained scores, and immediate versus delayed posttests. Taken together with the Training factor, these contrasts permit F tests of the effects of training or no training, and its staying power after one month.

The means and standard deviations of the trained and control groups

at both IQ levels on the Extended Kohs Test are presented in Table 1. While no differences between trained and control groups are evident on the pretest administration, both high and low IQ trained groups improved as a function of training more than their respective control groups. The analysis of variance revealed a significant interaction between Training and the pre- versus posttrained partition of the Testing factor ($F_{1,72} = 32.47$, $p < .001$) indicating support for the first hypothesis that trained students would profit from a systematic learning experience more than their nontrained controls. The three-way interaction (IQ X Training X Testing) was not significant, indicating that there was no differential effect of training among the two IQ groups. The immediate versus delayed posttraining scores partition of the Testing factor and all interactions involving this effect were not significant. There was no significant loss or gain by the trained groups as compared to the control groups between immediate and delayed posttests. Table 1 indicates that the trained students still performed at the higher levels on the nonverbal reasoning problems one month following training.

Insert Table 1 about here

Preliminary evidence suggesting the validity of this training-within-testing procedure (Hypothesis 2) was indicated by a significant partial correlation between Knox Cube scores and posttraining scores, with the effects of pretraining scores removed ($r = .538$, $p < .05$). It should be noted that Knox scores did not correlate significantly with PPVT raw scores ($r = .328$, ns). The teachers' ratings were compared

TABLE 1

Means and Standard Deviations of High and Low IQ Trained and Control Groups on Extended Kohs Pretest (K1), Immediate (K2), and Delayed (K3) Posttests

	K1		K2		K3	
	Mean	SD	Mean	IQ	Mean	IQ
Low IQ control	1.30	1.10	1.50	1.20	1.40	1.20
Low IQ trained	1.00	1.00	2.20	1.78	1.80	1.99
High IQ control	4.00	2.79	4.10	3.01	4.20	3.09
High IQ trained	4.10	2.84	5.40	3.23	5.50	3.32

with each S's learning potential category, with gainer defined a priori as a student who gained one or more levels after training, and nongainer as one whose performance did not improve following training. The teachers' ratings agreed with the categorization defined by the children's performance on the learning potential assessment (agreement on 16 of 20 Ss; $r_\phi = .560$, $p < .05$).

The third hypothesis which predicted the relationships between IQ and pre- and posttraining scores was also supported. PPVT data were significantly related to pretraining scores ($r = .504$ and $.524$, $p < .05$, for raw scores and MA scores, respectively) but were minimally related to posttraining scores when the effects of pretraining scores were removed ($r = .064$ and $.118$, for raw scores and MA scores, respectively).

Discussion

The results of this study, while preliminary in nature, support the further exploration of learning potential as an additional approach to evaluating the abilities of moderately and severely retarded persons. The significant improvement following training shown by many of the Ss in this study strongly suggests that one-session intelligence tests without training or cuing to the task(s) are inappropriate for moderately and severely retarded persons. Schucman's (1960) finding that learning scores, as opposed to IQ and pretraining scores, were stable and consistent indicators of ability to learn and profit from experience further indicates the questionable value of conventional IQ data and the need for a learning potential type of assessment strategy with this population.

The results of this study suggest that IQ and pretraining scores are misleading for those persons who demonstrate a substantial increment following a brief instructional session. For these persons, one can hypothesize a history of less than adequate learning opportunities, for which they are then penalized by the usual test situation. Hence, without a training experience during testing, many moderately and severely retarded persons may be unnecessarily and tragically excluded from, or misplaced within, an educational program.

The assessment approach used in this study involves providing task-relevant tuition rather than assuming that the moderately or severely retarded person has been exposed to appropriate instruction. The testing model attempts to determine the limits of the person's nonverbal intelligence by substantially altering the testing situation to include supportive instruction in a heretofore stressful situation replete with failure. Professionally, one is then oriented toward making tentative statements about what the person can be expected to do following instruction and toward asking questions regarding the facilitating or non-facilitating effects of a particular teaching strategy.

While this study has demonstrated that training does make a difference, in that Ss tended to redistribute themselves following instruction, further work is necessary to corroborate the importance of this difference by furnishing additional evidence of the predictive power of the learning potential assessment. An example with particular children may serve to illustrate the potential utility of this data. Two adolescent students, both with conventional test IQs of 16, were

given the learning potential task and scored low on the pretest. One student markedly improved his score following training; the second one showed no change. One can hypothesize that these students require different types and/or levels of programming. The logical sequel to this investigation, then, would be further work with learning potential to determine its predictive power with this population in other ability domains.

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Footnotes

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